

Case report

Skin rash associated with accidental addition of excess aluminium sulphate to the water supply

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INTRODUCTION

The fitness of water supplies for public consumption may be assured by minimal treatment where high purity sources are available. Aluminium sulphate is used in the coagulation process forming a floc which acts as a filter for the removal of finer particles. The presence of a high concentration of aluminium sulphate in the water supply lowers the pH of the water and may result in the release of copper, lead, nickel and zinc from plumbing systems.

Case History. A 40-year-old healthy Tyrone female took a bath in the afternoon of 9th October 1988 at her home in Carrickmore. Before getting into the bath she noticed that the water had a "bluish" tint. Immediately after her bath she developed a diffuse pale macular rash similar to that of rubella which was confined to the part of her body which had been submerged. The rash was itchy, not associated with systemic upset, and persisted for four weeks.

She was patch tested to the following aqueous solutions at the recommended concentrations: 2% aluminium sulphate, 1% lead acetate, 5% copper sulphate and 5% zinc sulphate. There was no immediate skin reaction after 20 minutes, and no delayed reaction after two and four days. However, further patch testing with nickel and cobalt revealed that she was very strongly allergic to both of these metals. She had been known to have a skin sensitivity to nickel, such as found in cheap jewellery.

Public Health investigations. Just before midnight on 8th October the Chief Officer of the Western Water Division for the Department of the Environment had contacted the Chief Administrative Medical Officer of the Western Health and Social Services Board informing him that an excessive amount of aluminium sulphate had been added to the water supply due to the malfunctioning of

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equipment. Notification to the public in Carrickmore was made through public notices, radio and subsequent press announcements, asking them to refrain from using water within the next 12 hours as it was contaminated with aluminium sulphate. Various samples at the point of delivery were taken for chemical analysis. The EEC maximum admissible concentration for aluminium in water for drinking is 0.2 mg/l.¹ Levels ranging from 0.05 mg/l in Garvaghey to 1.8 mg/l in Carrickmore were recorded on 10th October. By 7th November the levels had fallen to between 0.2–0.6 mg/l. At the time of the incident the pH in water supplied around the Carrickmore area had dropped to 5.0 for a short period² before rising to within the acceptable range of 5.5–9.5. Water samples taken from the patient's house on 9th December showed a pH of 9.0 to 9.2, nickel concentration of <0.02 mg/l and copper concentration of 0.03 to 0.07 mg/l.

DISCUSSION

Excessive amounts of aluminium sulphate had been added in the past to drinking water due to instrument failure³; in Carrickmore this fault was detected early so that amounts added were not very high. The low pH of the water may also have been associated with the release of metals from the plumbing system and the patient's rash may actually have been related to the presence of nickel in her bath water.

There is concern that in the long term aluminium in water may increase the risk of Alzheimer's disease, but present evidence is not sufficient to establish a causal relationship. Further epidemiological investigation is required but progress is slow as Alzheimer's disease may be misdiagnosed and under-reported, and exposure to aluminium in water is hard to determine accurately. Support for the hypothesis that aluminium in water is associated with the occurrence of Alzheimer's disease has come from a variety of sources.⁴ Dialysis patients were found to be at risk from encephalopathy in areas with high concentrations of aluminium in water. Animal experiments have shown that injecting aluminium into the brain produces neurofibrillary tangles similar to those found in Alzheimer's disease.

Martyn et al carried out a survey of 88 country districts in England and Wales and found a 50% increased risk of Alzheimer's disease in those areas where aluminium concentration in water exceeded 0.11 mg/l compared to areas with a concentration under 0.01 mg/l.⁵ Although the association between Alzheimer's disease and aluminium concentration was statistically significant, questions arose over the reliability of the data on the aluminium content of the water and the completeness of the ascertainment of frequency of Alzheimer's disease in the different areas.

In any future such incident, it would be wise to warn the public not to consume contaminated water, as well as not to bathe if they suffer from known allergy to metals.

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